THE GENERA OF MELASTOMATACEAE IN THE SOUTHEASTERN UNITED STATES[1]

JOHN J. WURDACK AND ROBERT KRAL

MELASTOMATACEAE A. L. de Jussieu, Gen. Pl. 328. 1789, "Melastomae," nom. cons.

(MELASTOME FAMILY)

Herbaceous or woody plants (rarely trees) with simple, usually exstipulate, opposite (usually decussate) leaves, characteristically with 3–5 palmately arranged longitudinal veins tending to parallel the leaf margins and with horizontal cross-veins between. Inflorescences usually cymose, the flowers complete, actinomorphic (but usually zygomorphic with respect to the orientation of stamens and style), usually 4- or 5-merous, with a well-developed, urn-shaped floral tube (hypanthium) bearing sepals, petals, and stamens at its summit. Petals free, usually white to purple (rarely orange or yellow), dextrorsely imbricate, usually spreading. Stamens isomorphic [or heteromorphic], usually twice the number of petals, often with sterile appendages at base of connective; stamens bright yellow [purple or other colors], usually opening by a single pore at or near the apex. Gynoecium syncarpous, with a single style and stigma, the ovary (1- to) 4- or 5- (to 11-)loculate, with axile placentation, often adnate to the floral tube (except near the apex) [or free from the floral tube], maturing into a many-seeded capsule or berrylike fruit. Seeds small, lacking endosperm. TYPE GENUS: *Melastoma* L.

A large, primarily tropical group of about 200 genera and 4500 species, most of which are easily recognized as belonging to the family by both leaf venation and stamen morphology. No genus is common to both the New and Old Worlds, but several Neotropical species have become noxious weeds in

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The illustration of *Rhexia* was drawn by Virginia Savage from dissections by Carroll Wood; that of *Tetrazygia* is by Karen Stoutsenberger from dissections by Kenneth R. Robertson. Liquid-preserved specimens for illustration were collected by R. B. Channell, H. F. L. Rock, Alice Tryon, Carroll Wood, and John Wurdack; other materials were from the Gray Herbarium.

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the Paleotropics. The stamens can be dimorphic, and they frequently bear highly modified appendages. (C. L. Wilson, however, cited these peculiar stamens as corroborating the "telome theory.") The family is represented in the continental United States only by *Rhexia* (of tribe Rhexieae), all species of which occur in the southeastern United States (and one of which is also in the West Indies), and by a single species of *Tetrazygia* (of tribe Miconieae), a predominantly West Indian genus.

Species of some 18 other genera are grown "as ornamentals either in greenhouses or outdoors in warm climates" in the United States (see *Hortus Third*). Among the most widely cultivated is the showy, purple-flowered *Tibouchina Urvilleana* (DC.) Cogn. (*T. semidecandra* Hort.) (see Wurdack, 1967; *Hortus Third*); at least eight other species of this large tropical American genus (ca. 350 spp.) are in cultivation in the United States.

Pollination is usually by insects, especially bumblebees, rarely (in tropical America) by hummingbirds, bats, or rats. The pollen of most Melastomataceae is 3-colporate. Wood anatomy includes the features of fiber-tracheids, included phloem, and usually solitary tracheids. The diversity and complexity of hair types are the greatest in any family of flowering plants.

Chromosome numbers are known in only about one third of the genera of melastomes and less than 10 percent of the species. The commonest base numbers are 9 and 17. Fossils (leaves) are known from widely scattered parts of the Northern Hemisphere, with very few Southern Hemisphere records. Ages are mostly Tertiary (Miocene), with a few Quaternary; data are found in the U. S. Geological Survey Compendium Index to Paleobotany.

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KEY TO THE GENERA OF MELASTOMATACEAE IN THE SOUTHEASTERN UNITED STATES

Plants herbaceous; flowers 4-merous; fruits capsular; seeds usually cochleate. . . . . 1. *Rhexia.*

Plants woody; flowers 5-merous; fruits berrylike; seeds cuneate. . . . 2. *Tetrazygia.*

Subfamily MELASTOMATOIDEAE [Seringe ex DC., "Subordo Melastomeae"]

Tribe RHEXIEAE DC. Prodr. 3: 114. 1828.

1. **Rhexia** Linnaeus, Sp. Pl. **1:** 346. 1753; Gen. Pl. ed. 5. 163. 1754.

Erect, sometimes suffrutescent perennial herbs, mostly of seasonally wet acidic soils of the Atlantic and Gulf Coastal Plain of the United States. Root buds on rhizomelike roots, or from tubers, stems usually erect, arising from woody caudices, mostly glandular-hirsute, more or less quadrangular, with faces subequal or with one opposing set broader and convex, the other narrower and concave, often subligneous toward the base and with a thin, exfoliating bark. Flowers in simple or compound bracteate dichasia (sometimes a bostryx), 4-merous, showy, the petals fugacious, lavender to purple, rose, or white (yellow in *R. lutea*). Stamens 8, more or less isomorphic, the filaments exserted, the anthers linear or linear-lanceolate, mostly curved, at anthesis unilocular and subapically poricidal, the connective base appendaged. Ovary adnate to floral tube (except at apex), 4-locular, the ovules numerous on massive placentae; style linear, curved, exserted; stigma capitate. Fruit a loculicidal capsule retained in the lower, globose part of the flask-shaped, variously necked floral tube (hypanthium). Seeds cochleate (cuneate-prismatic in *R. alifanus* Walter). Chromosomes $2n = 22, 44, 66$. LECTOTYPE SPECIES: *R. virginica* L.; see Britton & Brown, Illus. Fl. No. U. S. Canada. ed. 2. **2:** 582. 1913. (Name derived from Greek, *rhexis*, a breaking or bursting forth. According to Barton, Pliny used the name for a plant thought to be a species of *Anchusa* or *Echium* [Boraginaceae].)—MEADOW-BEAUTY, DEERGRASS.

The genus includes eleven clearly marked species and three varieties, all represented in the southeastern United States, but with *R. cubensis* Griseb. extending into the West Indies (Cuba, Hispaniola, and Puerto Rico) and *R. virginica* L. into eastern Canada. The greatest concentration of species and the most morphological variation within species occur in northwestern Florida.

Four natural entities are evident (see Kral & Bostick). *Rhexia alifanus* Walter stands alone as the only species with essentially glabrous, isofacial, subentire, and glaucous leaves, caducous bracts, and seeds fully twice the size of those of other species and (unique in the Rhexieae) oblong-cuneate and subprismatic in shape, much like small corn grains. The yellow-petaled *R. lutea* Walter, a bushy subshrub with short, straight anthers opening by large, oblique pores, represents the second unit. This species is distinct enough anatomically and chromatographically to be placed in a section of its own (see Kral & Bostick). Both members of the third group, *R. petiolata* Walter and *R. Nuttallii* James, are low plants with woody, caudiciform rootstocks; flowers and fruit bases hidden by broad, persistent bracts; short, straight, large-pored anthers (as in *R. lutea*); and ascending-liguliform (rather than plane and spreading) petals. This pair of species is the least variable morphologically, while the fourth and largest group (seven species) is the most plastic genetically and phenotypically. These last species have elongate, small-pored anthers (as in *R. alifanus*) but produce the conventional small, cochleate seed of the other rhexias. Perennation is either by buds that form along shallow, elongate, rhizomelike roots, by fusiform tubers, or by a combination of both. Many of these species are weedy in character.

Several authors (Leggett; James; Kral & Bostick) have observed pollination of various species of *Rhexia* by bees. Other insects may also be involved because *Rhexia* buds usually open in late evening or at night (the petals

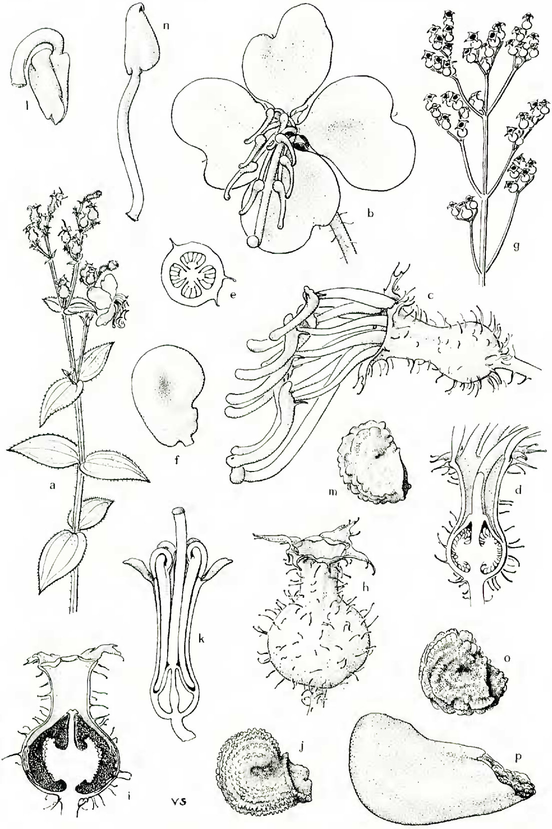

FIGURE 1. **Rhexia.** a–j, *R. virginica:* a, tip of flowering plant, × ½; b, flower, × 2; c, same, side view with petals removed to show floral tube and arrangement of stamens (note pore at tip of anther), × 4; d, floral tube and gynoecium in vertical section (note partly inferior ovary and placentation), × 4; e, diagrammatic cross sec-

usually are shed around midday), but no observations have been made of insect visitors during this period. (For an account of pollination in *R. virginica* see Leggett; in *R. mariana* L., see James.) Because flowering times of all species overlap and several species may be found in the same site, and because outcrossing appears to be the common mode, it is reasonable to rule out pollen availability as a limiting factor in hybridization.

Natural F_1 hybrids have been recognized by several observers (Bostick, James, Kral): *Rhexia mariana* × *R. virginica, R. aristosa* Britton × *R. virginica, R. mariana* × *R. salicifolia* Kral & Bostick, *R. virginica* × *R. salicifolia* (Kral, previously unreported), *R. mariana* × *R. Nashii* Small (hybrid swarms reported by Kral), *R. Nashii* × *R. virginica*, and *R. Nashii* × *R. cubensis*. In these hybrids, except in the case of observed backcrosses, there is early abscission of most fruit, and few seeds mature in capsules that remain attached. Only *R. Nuttallii, R. petiolata, R. lutea,* and *R. alifanus* seem not to hybridize with other species.

Test crosses made by James (1956) and a rather extensive series made by Bostick (see Kral & Bostick, 1969) showed that self-pollination resulted in germinable seed only in *Rhexia petiolata* and *R. lutea*, and in no seed whatever in *R. alifanus*. Germinable seeds were formed in crosses between *R. Nuttallii* and *R. petiolata* Walter; between *R. aristosa* and both *R. virginica* and *R. salicifolia*; between *R. Nashii* tetraploids and tetraploids of *R. mariana* and *R. virginica*, and between the tetraploid varieties *ventricosa* (Fern. & Griscom) Kral & Bostick and *interior* (Penn.) Kral & Bostick of *R. mariana*. Some seed was produced in crosses involving equal ploidy levels of most of the species (*R. parviflora* × *R. mariana; R. cubensis* × *R. Nashii; R. cubensis* × *R. mariana; R. mariana* × *R. salicifolia; R. mariana* × its varieties, and *R. mariana* vars. × *R. virginica*), but these seeds were not germinable, presumably because of some postzygotic isolating mechanism. The frequent occurrence of natural hybrids in the field can best be explained as a result of occasional bypassing of the isolating mechanism in parts of the ranges of such weedy species as *R. mariana, R. virginica, R. Nashii,* and *R. cubensis*.

Characteristics of the rootstock, stem faces, trichomes, staminal appendages and anther shape, hypanthial configurations, and seed sculpture have all been used in taxonomic treatments, with seed sculpture being the most variable and therefore the least reliable feature. Comparative studies of epidermis may have a higher diagnostic value than has yet been realized.

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tion of ovary, × 4; f, ovule, side view, × 50; g, semidiagrammatic view of infructescence with leaves and bracts removed, hairs omitted, to show cymose arrangement of flowers, × ½; h, floral tube enclosing mature fruit, × 4; i, same in vertical section, seeds removed from placentae, × 4; j, seed, × 30. k, *R. Nashii:* bud immediately before anthesis, in vertical section, petals removed, to show position of anthers within floral tube, × 3. 1, m, *R. Nuttallii:* 1, stamen from flower bud, × 12; m, seed, × 30. n, *R. petiolata;* stamen from open flower, × 12. o, *R. cubensis:* seed, × 30. p, *R. alifanus:* seed, × 30.

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Tribe Miconieae DC. Prodr. **3:** 152. 1828.

2. **Tetrazygia** L. C. Richard ex DC. Prodr. **3:** 172. 1828.

Shrubs or small trees. Young branches silvery-scaly or becoming glabrous. Leaves with 3 main veins, silvery-scaly beneath, the margins entire. Inflorescences terminal; flowers (4- or) 5- (or 6-)merous. Calyx lobes rounded and inconspicuous; petals cuneate, white (to pink), often turning yellow in drying. Stamens (8 or) 10 (or 12), isomorphic, the connective without appendages, the anthers linear. Ovary 3-locular; fruit berrylike, turning blue-black, with many cuneate seeds. Chromosomes, $2n = 34$. Lectotype species: *T. discolor* (L.) DC.; see Britton & Wilson, Sci. Survey Porto Rico Virgin Is. **6**(1): 4. 1925.[2] (Name from Greek, *tetra*, four, and *zygon*, yoke, from the four-merous flowers of the species known to De Candolle; adopted by him from collection data in Richard's herbarium.)

The genus includes about 25 species, primarily of the West Indies. Only *Tetrazygia bicolor* (Miller) Cogniaux, of Cuba, the Bahamas, and subtropical Florida, occurs in our area. In the pinelands of the Miami area of Florida and the Everglade Keys the plant is usually a shrub, but in the denser hammocks it can be a small tree up to 10 m tall and 6–10 cm in diameter. This species is usually placed in Cogniaux's sect. Miconiastrum on the basis of its 5-merous (*vs.* 4-merous) flowers, but the taxonomic discreteness of the section, as well as that of the several species placed in it, is questionable. The diversity in stamen morphology, number of floral parts, and shape of the calyx lobes suggests the desirability of further investigations, especially in defining the limits of the genus and in determining its affinities within the tribe Miconieae.

[2] Britton and Millspaugh (Bahama Fl. 298. 1920) designated *Tetrazygia tetrandra* (Sw.) DC. as type species, but apparently discovered later that Swartz's *Melastoma tetrandra* is *Miconia tetrandra* (Sw.) D. Don (see Adams, Fl. Jamaica), hence the switch of the type to *T. discolor*. In establishing the genus *Tetrazygia* De Candolle himself expressed doubts about the relationship of *T. tetrandra* to the four other species he placed in the genus: "An genus proprium?"

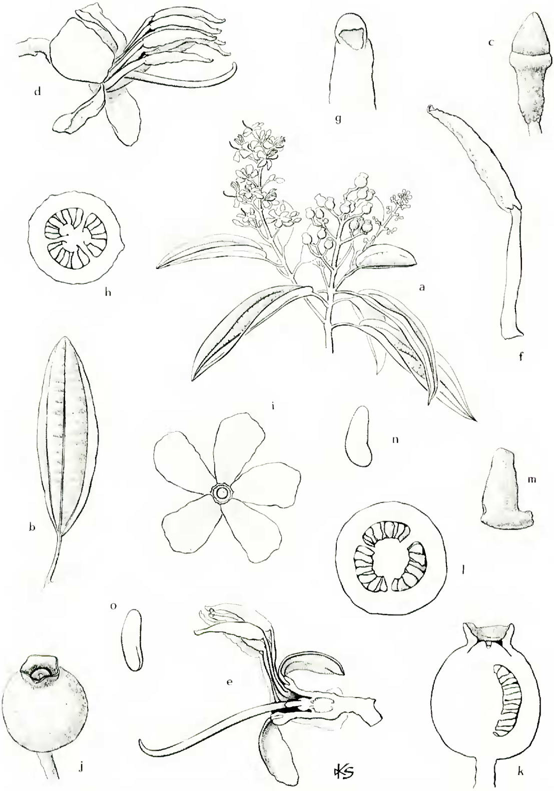

FIGURE 2. **Tetrazygia.** a–o, *T. bicolor:* a, branchlet with flowers and immature fruit, × 1/4; b, leaf, × 1/2; c, flower bud, × 3; d, side view of flower, × 3; e, flower in section, × 3; f, stamen, × 5; g, tip of anther, showing pore, × 25; h, semidiagrammatic cross section of ovary, × 10; i, flower, from above, after fall of stamens and style (note rim of floral cup and disc on top of ovary), × 2; j, mature fruit, × 2; k, same, in vertical section, × 3; l, semidiagrammatic cross section of fruit, × 3; m, seed, × 12; n, o, two views of embryo oriented as in seed, × 12.

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J. J. W.
DEPARTMENT OF BOTANY
NATIONAL MUSEUM OF NATURAL HISTORY
SMITHSONIAN INSTITUTION
WASHINGTON, D. C. 20560

R. K.
DEPARTMENT OF BIOLOGY
VANDERBILT UNIVERSITY
NASHVILLE, TENNESEE 37203